DS26F31MQML Quad High Speed Differential Line Drivers

Check for Samples: DS26F31MQML

FEATURES

- **Operation from Single +5.0V Supply**
- **Outputs Won't Load Line When V_{CC} = 0V**
- **Output Short Circuit Protection**
- **Meets the Requirements of EIA Standard RS-422**
- **High Output Drive Capability for 100Ω Terminated Transmission Lines**

DESCRIPTION

The DS26F31M is a quad differential line driver designed for digital data transmission over balanced lines. The DS26F31M meets all the requirements of EIA Standard RS-422 and Federal Standard 1020. It is designed to provide unipolar differential drive to twisted-pair or parallel-wire transmission lines.

The DS26F31M offers improved performance due to the use of state-of-the-art L-FAST bipolar technology. The L-FAST technology allows for higher speeds and lower currents by utilizing extremely short gate delay times. Thus, the DS26F31M features lower power, extended temperature range, and improved specifications.

The circuit provides an enable and disable function common to all four drivers. The DS26F31M features TRI-STATE outputs and logical OR-ed complementary enable inputs. The inputs are all LS compatible and are all one unit load.

The DS26F31M offers optimum performance when used with the DS26F32 Quad Differential Line Receiver.

Connection and Logic Diagrams

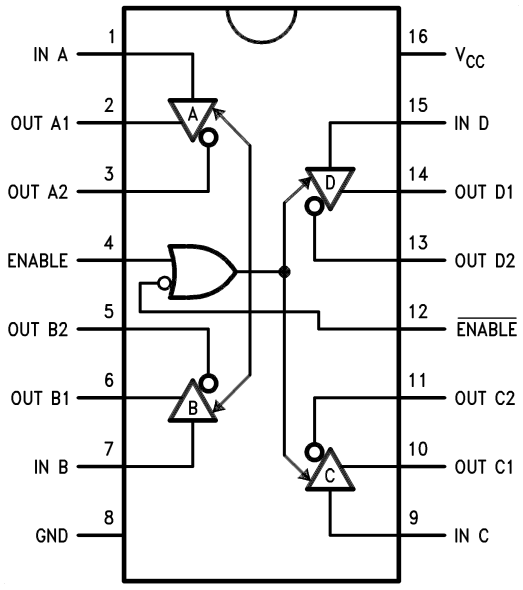


Figure 1. 16-Lead CDIP Package- Top View
See Package Numbers NFE0016A, NAD0016A, NAC0016A

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 2006–2013, Texas Instruments Incorporated

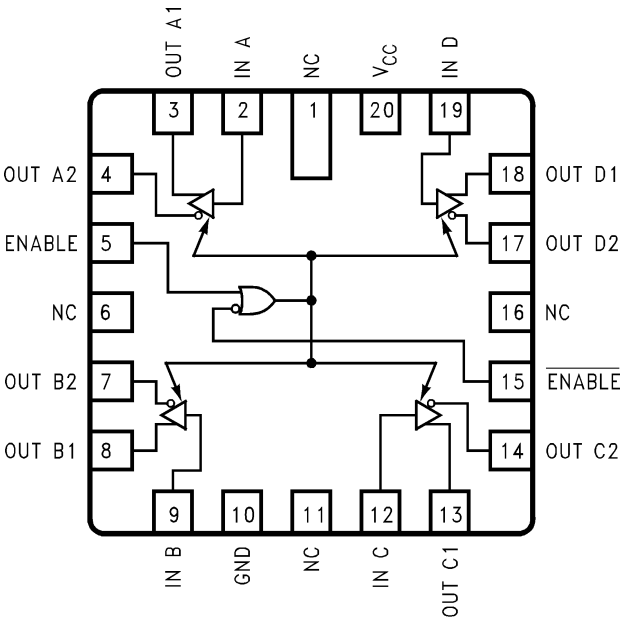


Figure 2. 20-Lead LCCC Package
See Package Number NAJ0020A

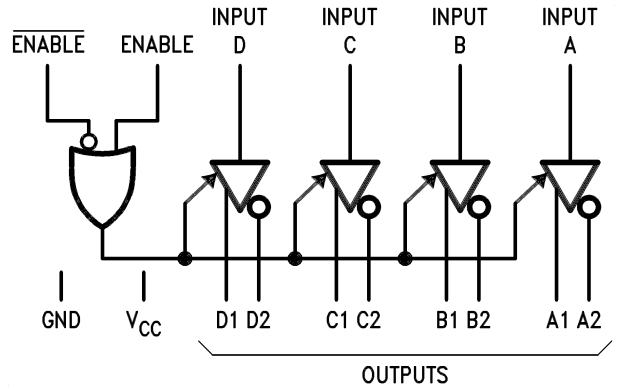


Figure 3. Logic Symbol

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Copyright © 2006–2013, Texas Instruments Incorporated

Absolute Maximum Ratings(1)

Storage Temperature Range	−65°C ≤ T_A ≤ +175°C
Lead Temperature (Soldering, 60 sec.)	300°C
Supply Voltage	7.0V
Input Voltage	7.0V
Output Voltage	5.5V
Maximum Power Dissipation at 25°C (2)	450mW
Thermal Resistance	
θ_{JA}	
NFE0016A, derate above +25°C @ 11.4mW/°C	88°C/mW
NAD0016A, derate above +25°C @ 6.6 mW/°C	151°C/mW
NAJ0020A, derate above +25°C @ 12.3 mW/°C	81°C/mW
θ_{JC}	
NFE0016A	14°C/mW
NAD0016A	13°C/mW
NAJ0020A	15°C/mW

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not verify specific performance limits. For verified specifications and test conditions, see the Electrical Characteristics. The verified specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
(2) Power dissipation must be externally controlled at elevated temperatures.

Recommended Operating Range

Temperature	−55°C ≤ T_A ≤ +125°C
Supply Voltage	4.5V to 5.5V

Table 1. Radiation Features

DS26F31MJFQMLV	300 krads (Si)
DS26F31MWFQMLV	300 krads (Si)
DS26F31MWGFQMLV	300 krads (Si)

Quality Conformance Inspection

Table 2. Mil-Std-883, Method 5005 - Group A

Subgroup	Description	Temp °C
1	Static tests at	25
2	Static tests at	125
3	Static tests at	-55
4	Dynamic tests at	25
5	Dynamic tests at	125
6	Dynamic tests at	-55
7	Functional tests at	25
8A	Functional tests at	125
8B	Functional tests at	-55
9	Switching tests at	25
10	Switching tests at	125
11	Switching tests at	-55
12	Settling time at	25
13	Settling time at	125
14	Settling time at	-55

Copyright © 2006–2013, Texas Instruments Incorporated

DS26F31M Electrical Characteristics DC Parameters (1)

Parameter		Test Conditions	Notes	Min	Max	Units	Sub-groups
V_{IH}	Logical "1" Input Voltage	V_{CC} = 4.5V	(2)	2.0		V	1, 2, 3
V_{IL}	Logical "0" Input Voltage	V_{CC} = 5.5V	(2)		0.8	V	1, 2, 3
V_{OH}	Logical "1" Output Voltage	V_{CC} = 4.5V, I_{OH} = -20mA, V_{IL} = 0.8V, V_{IH} = 2V		2.5		V	1, 2, 3
V_{OL}	Logical "0" Output Voltage	V_{CC} = 4.5V, I_{OL} = 20mA, V_{IL} = 0.8V, V_{IH} = 2V			0.5	V	1, 2, 3
I_{IH}	Logical "1" Input Current	V_{CC} = 5.5V, V_I = 2.7V	(3)	-2.0	20	µA	1, 2, 3
I_{IL}	Logical "0" Input Current	V_{CC} = 5.5V, V_I = 0.4V	(3)	100	-200	µA	1, 2, 3
I_I	Input Reverse Current	V_{CC} = 5.5V, V_I = 7V	(3)	-0.01	0.1	mA	1, 2, 3
I_{OZ}	TRI-STATE Output Current	V_{CC} = 5.5V, V_O = 0.5V			-20	µA	1, 2, 3
		V_{CC} = 5.5V, V_O = 2.5V			20	µA	1, 2, 3
V_I	Input Clamp Voltage	V_{CC} = 4.5V, I_I = -18mA			-1.5	V	1, 2, 3
$I_{SC\ Min}$	Output Short Circuit Current	V_{CC} = 5.5V, V_O = 0V		-30		mA	1, 2, 3
$I_{SC\ Max}$	Output Short Circuit Current	V_{CC} = 5.5V, V_O = 0V			-150	mA	1, 2, 3
$I_{CC\ Dis}$	Power Supply Current	V_{CC} = 5.5V, V_I = 0.8V or 2V, VEn = 0.8V, $\overline{VEn}$ = 2V			50	mA	1, 2, 3
$I_{CC\ En}$	Power Supply Current	V_{CC} = 5.5V, VEn = 2V, $\overline{VEn}$ = 0.8V			40	mA	1, 2, 3

(1) Pre and post irradiation limits are identical to those listed under AC and DC electrical characteristics, except as listed in the Post Radiation Limits Table — if applicable. Radiation end point limits for the noted parameters are specified only for the conditions, as specified.
(2) Parameter tested go-no-go only.
(3) The minimum limits apply to device Class Q & V. The limits specified for the INPUT LOW CURRENT represents the numerical range in which this parameter will pass.

DS26F31M Electrical Characteristics AC Parameters - Propagation Delay Time

The following conditions apply, unless otherwise specified.
AC: V_{CC} = 5V, C_L = 50pF or equivalent impedance provided by diode load

Parameter		Test Conditions	Notes	Min	Max	Units	Sub-groups
t_{PLH}	Input to Output		(1)		16	nS	9
			(1)		24	nS	10, 11
		C_L = 30pF	(2)		15	nS	9
			(2)		23	nS	10, 11
t_{PHL}	Input to Output		(1)		17	nS	9
			(1)		25	nS	10, 11
		C_L = 30pF	(2)		15	nS	9
			(2)		23	nS	10, 11
t_{LZ}	Disable Time		(1)		38	nS	9
			(1)		56	nS	10, 11
		C_L = 10 pF	(2)		35	nS	9
			(2)		53	nS	10, 11
t_{HZ}	Disable Time		(1)		23	nS	9
			(1)		30	nS	10, 11
		C_L = 10 pF	(2)		20	nS	9
			(2)		27	nS	10, 11

(1) Tested at 50pF, system capacitance exceed 10 and 30pF.
(2) Testing at 50pF specifies limits at 10 and 30pF.

Copyright © 2006–2013, Texas Instruments Incorporated

DS26F31M Electrical Characteristics AC Parameters - Propagation Delay Time (continued)

The following conditions apply, unless otherwise specified.
AC: V_{CC} = 5V, C_L = 50pF or equivalent impedance provided by diode load

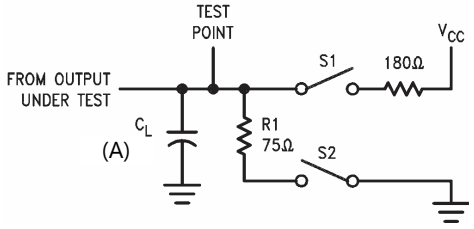
Parameter		Test Conditions	Notes	Min	Max	Units	Sub-groups
t_{ZL}	Enable Time		(1)		28	nS	9
			(1)		40	nS	10, 11
		C_L = 30pF	(2)		25	nS	9
			(2)		37	nS	10, 11
t_{ZH}	Enable Time		(1)		32	nS	9
			(1)		52	nS	10, 11
		C_L = 30 pF	(2)		30	nS	9
			(2)		50	nS	10, 11
Skew	Output to Output		(1)		6.0	nS	9
			(1)		9.0	nS	10, 11
		C_L = 30pF	(2)		4.5	nS	9
			(2)		7.0	nS	10, 11

DS26F31M Electrical Characteristics DC Drift Parameters

This section applies to -QMLV devices only and shall be read & recorded at T_A = +25°C before and after each burn-in & Subgroup B5, and shall not change by more than the limits indicated. The delta rejects shall be included in the PDA calculations.

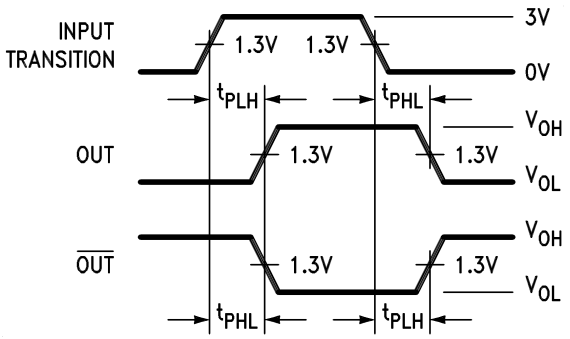
Parameter		Test Conditions	Notes	Min	Max	Units	Sub-groups
V_{OH}	Logical "1" Output Voltage	V_{CC} = 4.5V, I_{OH} = -20mA, V_{IL} = 0.8V, V_{IH} = 2V.		-250	250	mV	1
V_{OL}	Logical "0" Output Voltage	V_{CC} = 4.5V, I_{OL} = 20mA, V_{IL} = 0.8V, V_{IH} = 2V.		-50	50	mV	1
$I_{CC\ En}$	Power Supply Current	V_{CC} = 5.5V, V_I = 0.8V or 2V, VEn = 2V, $\overline{VEn}$ = 0.8V.		-8.0	8.0	mA	1
$I_{CC\ Dis}$	Power Supply Current	V_{CC} = 5.5V, V_I = 0.8V or 2V, VEn = 0.8V, $\overline{VEn}$ = 2V.		-8.0	8.0	mA	1

TEST CIRCUIT AND TIMING WAVEFORMS



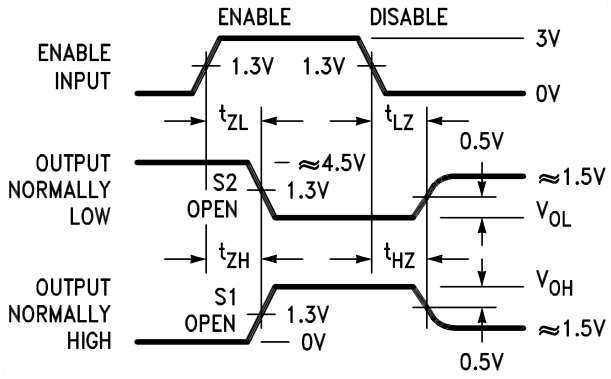
A. Parameter tested go-no-go only.
S1 and S2 of Load Circuit are closed except where shown.
C_L includes probe and jig capacitance.

Figure 4. AC Load Test Circuit for TRI-STATE Outputs



Pulse Generator for all Pulses: Rate ≤ 1.0 MHz, Z_O = 50Ω, t_r ≤ 6.0 ns, t_f ≤ 6.0 ns.

Figure 5. Propagation Delay (1) (2)



Pulse Generator for all Pulses: Rate ≤ 1.0 MHz, Z_O = 50Ω, t_r ≤ 6.0 ns, t_f ≤ 6.0 ns.

Diagram shown for Enable Low. Switches S1 and S2 open.

Figure 6. Enable and Disable Times (2)

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not verify specific performance limits. For verified specifications and test conditions, see the Electrical Characteristics. The verified specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

(2) All currents into the device pins are positive; all currents out of the device pins are negative. All voltages are referenced to ground unless otherwise specified.

TYPICAL APPLICATION

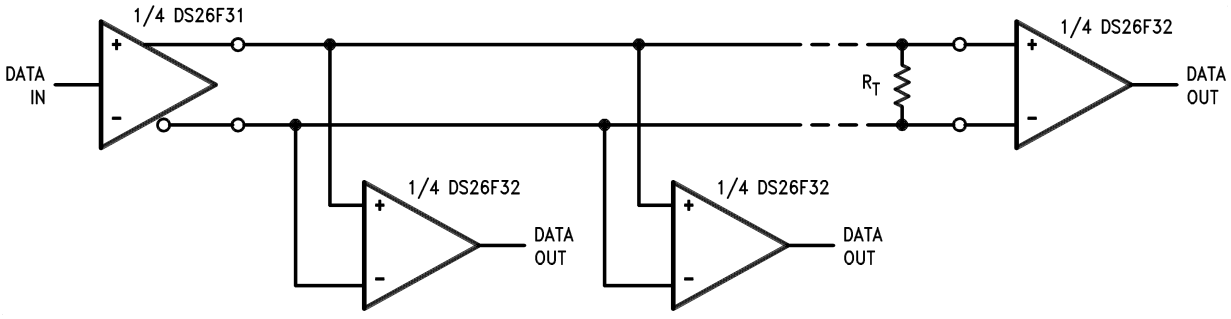


Figure 7. Typical Application

Copyright © 2006–2013, Texas Instruments Incorporated

REVISION HISTORY

Released	Revision	Section	Originator	Changes
3/01/06	*	New Release, Corporate format	L. Lytle	1 MDS data sheet converted into one Corp. data sheet format. MNDS26F31M-X-RH Rev 0B0 will be archived.
4/15/2013	A			Changed layout of National Data Sheet to TI format

Copyright © 2006–2013, Texas Instruments Incorporated

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-7802302M2A	ACTIVE	LCCC	NAJ	20	50	RoHS-Exempt & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS26F31ME/ 883 Q 5962-78023 02M2A ACO 02M2A >T	Samples
5962-7802302MFA	ACTIVE	CFP	NAD	16	19	Non-RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS26F31MW /883 Q 5962-78023 02MFA ACO 02MFA >T	Samples
5962F7802302VFA	ACTIVE	CFP	NAD	16	19	Non-RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS26F31MWF QMLV Q 5962F78023 02VFA ACO 02VFA >T	Samples
DS26F31ME/883	ACTIVE	LCCC	NAJ	20	50	RoHS-Exempt & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS26F31ME/ 883 Q 5962-78023 02M2A ACO 02M2A >T	Samples
DS26F31MW/883	ACTIVE	CFP	NAD	16	19	Non-RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS26F31MW /883 Q 5962-78023 02MFA ACO 02MFA >T	Samples
DS26F31MWFQMLV	ACTIVE	CFP	NAD	16	19	Non-RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS26F31MWF QMLV Q 5962F78023 02VFA ACO 02VFA >T	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

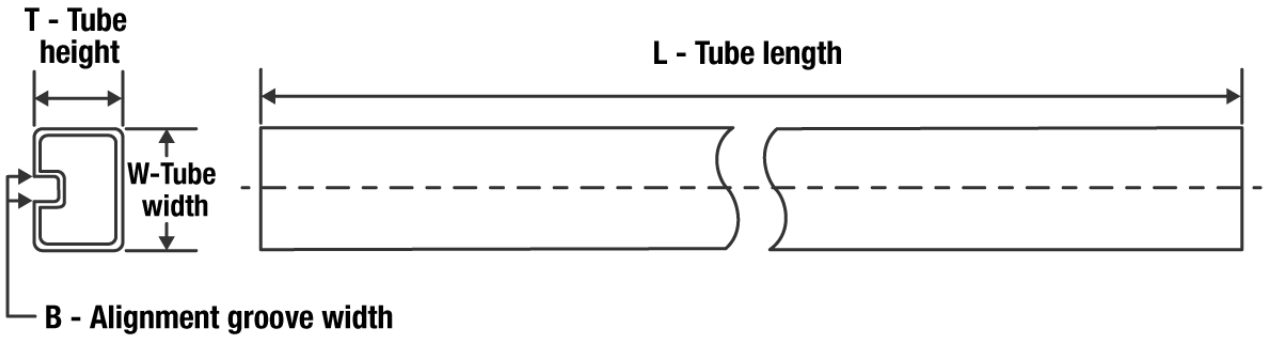
OTHER QUALIFIED VERSIONS OF DS26F31MQML, DS26F31MQML-SP :

- Military : DS26F31MQML
- Space : DS26F31MQML-SP

NOTE: Qualified Version Definitions:

- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

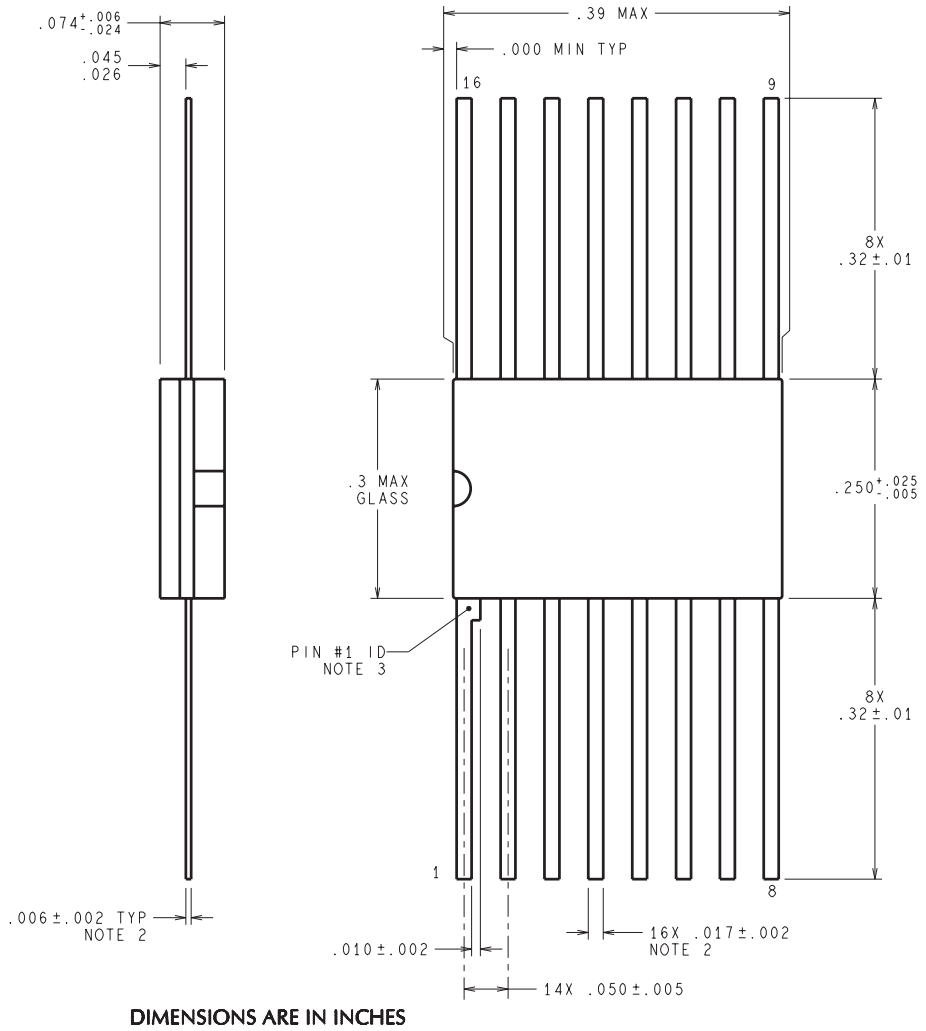
TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-7802302M2A	NAJ	LCCC	20	50	470	11	3810	0
5962-7802302MFA	NAD	CFP	16	19	502	23	9398	9.78
5962F7802302VFA	NAD	CFP	16	19	502	23	9398	9.78
DS26F31ME/883	NAJ	LCCC	20	50	470	11	3810	0
DS26F31MW/883	NAD	CFP	16	19	502	23	9398	9.78
DS26F31MWFQMLV	NAD	CFP	16	19	502	23	9398	9.78

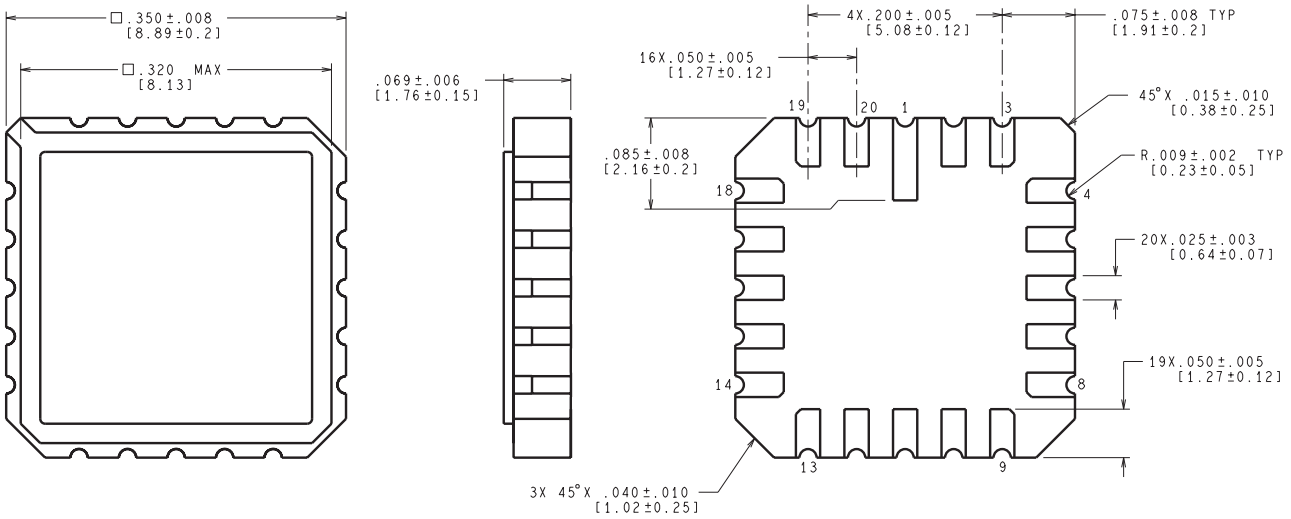
NAD0016A



DIMENSIONS ARE IN INCHES

W16A (Rev T)

NAJ0020A



CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS

E20A (Rev F)

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2022, Texas Instruments Incorporated